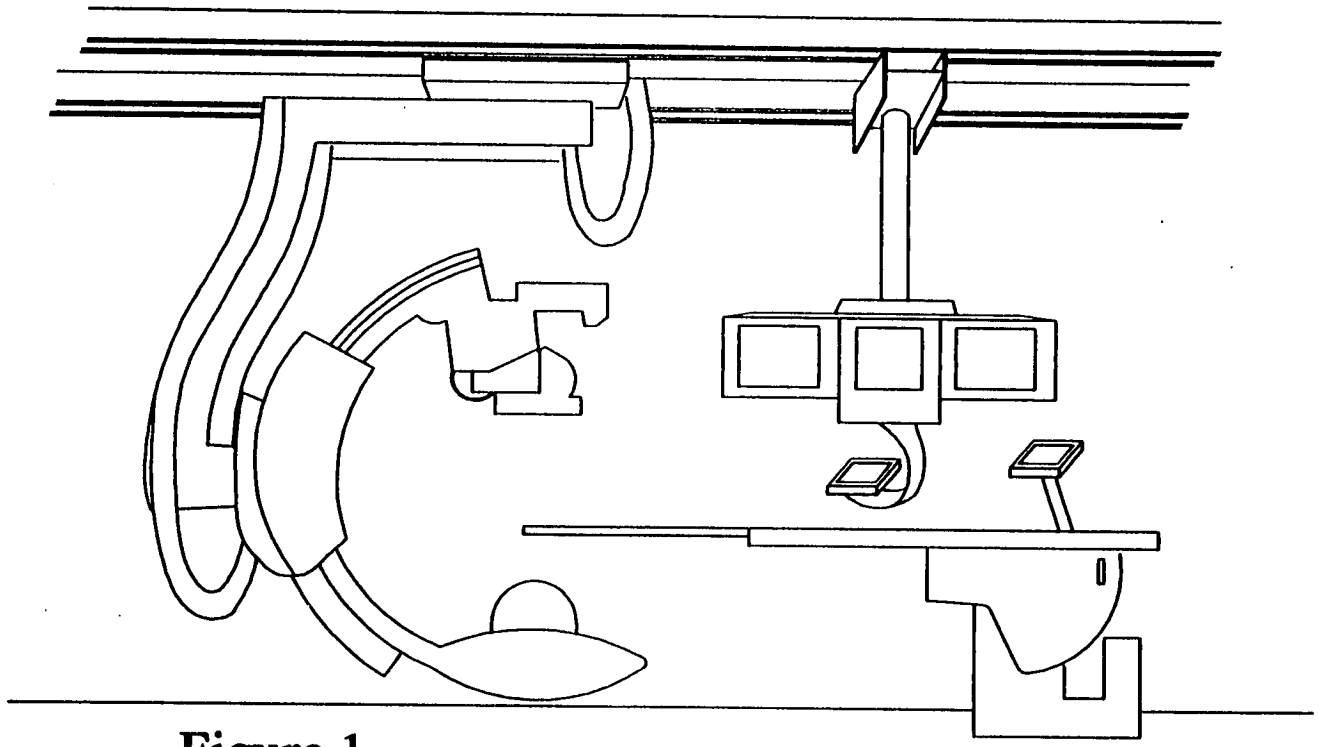
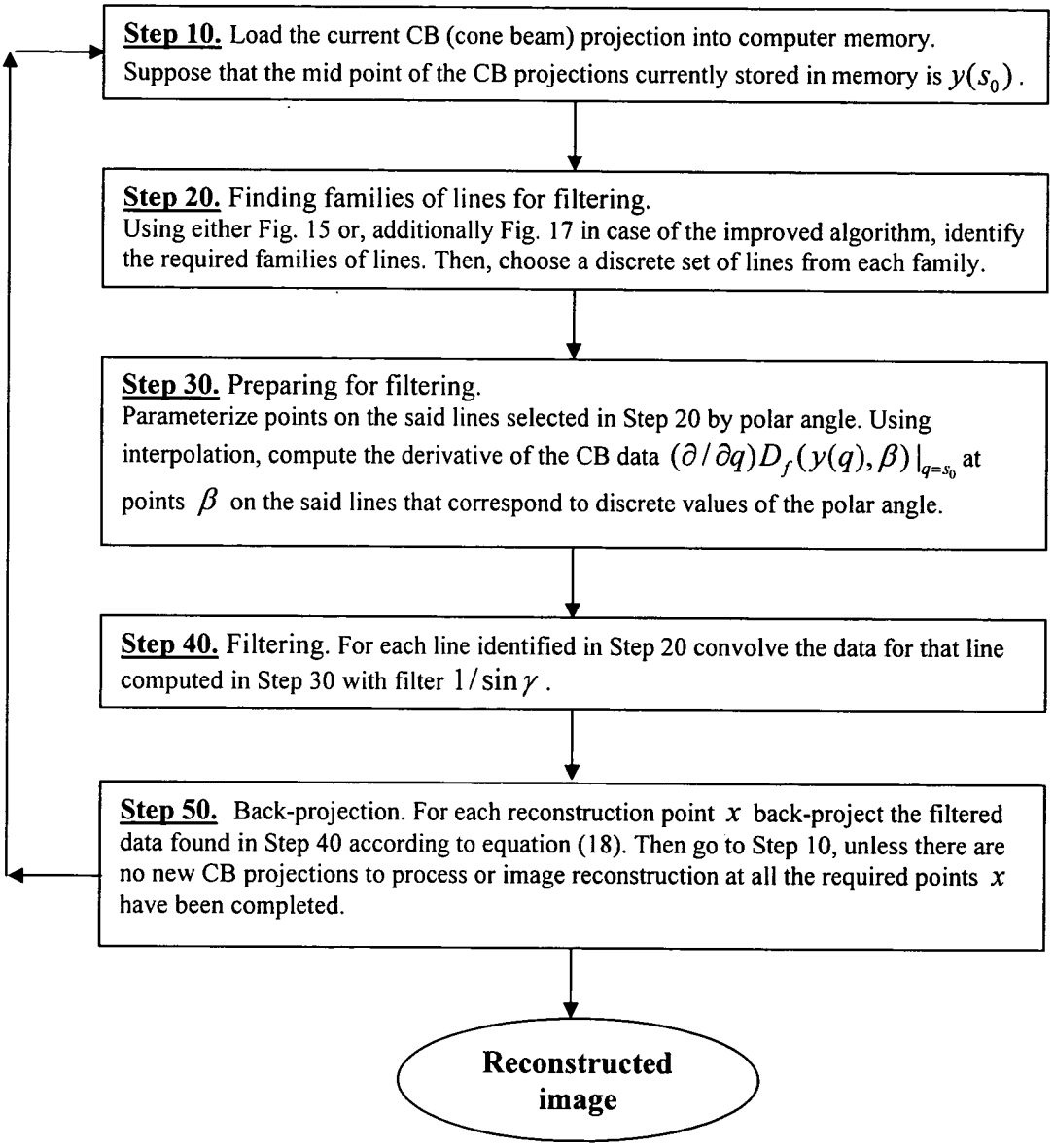


Figure 1.

Fig. 2

Overview of the basic process steps of the invention



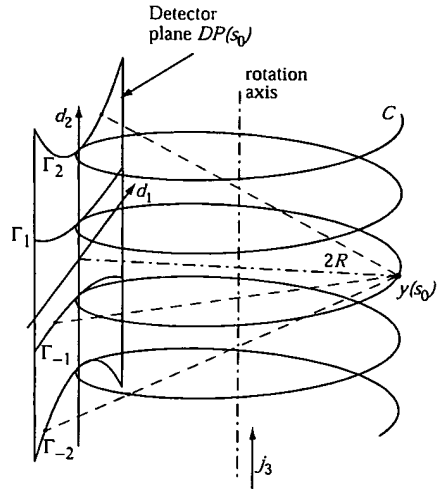


FIGURE 3

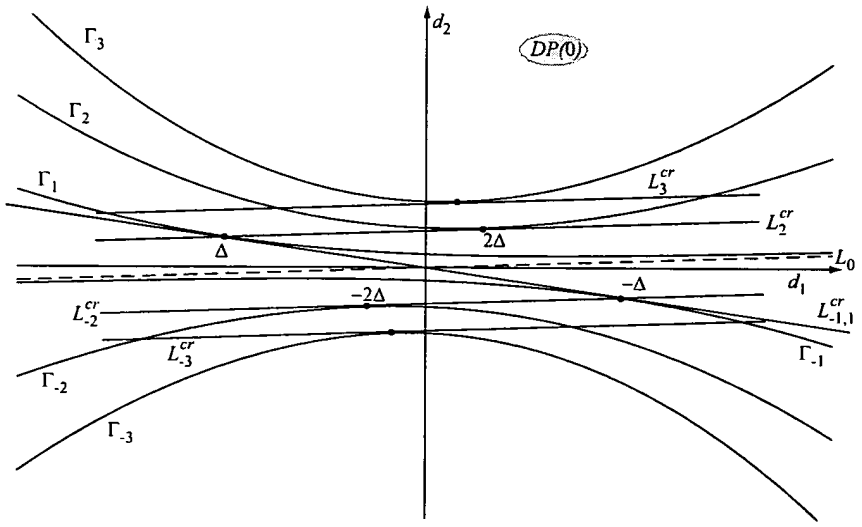


FIGURE 4

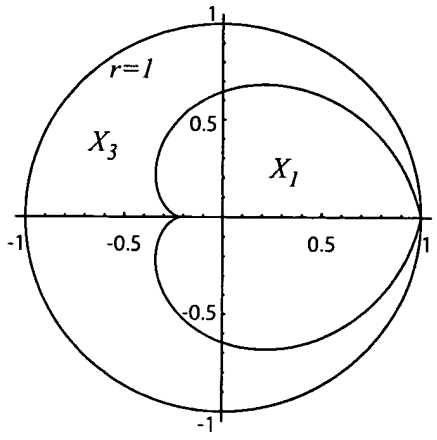


FIGURE 5

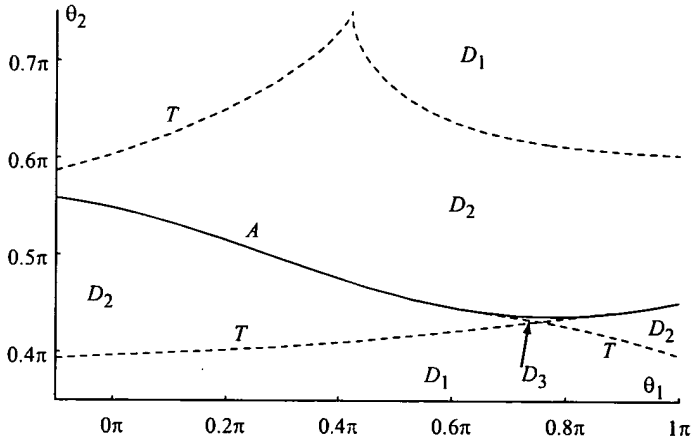


FIGURE 6

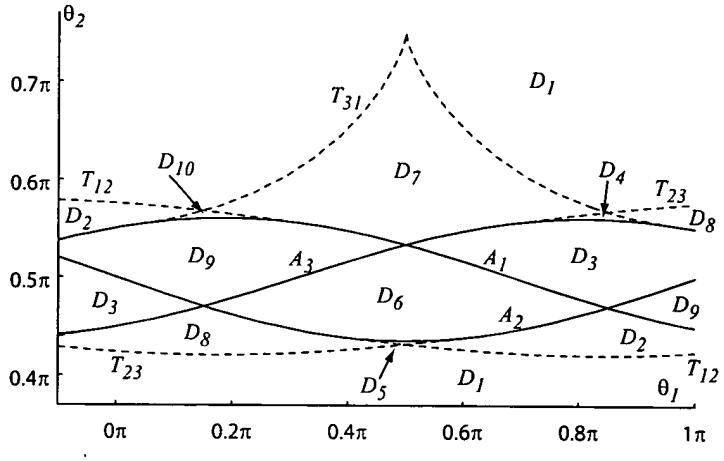


FIGURE 7

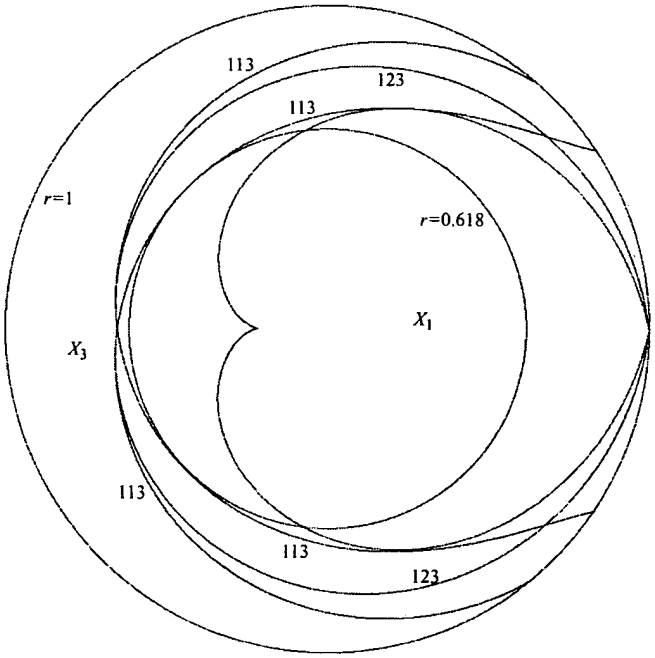


FIGURE 8

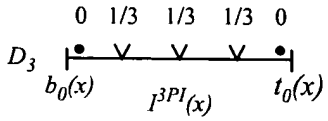


FIGURE 9

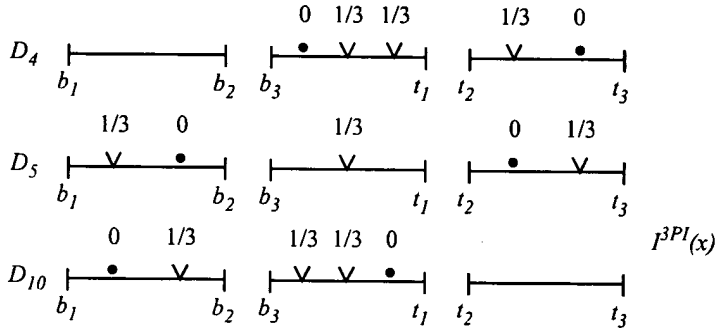


FIGURE 10

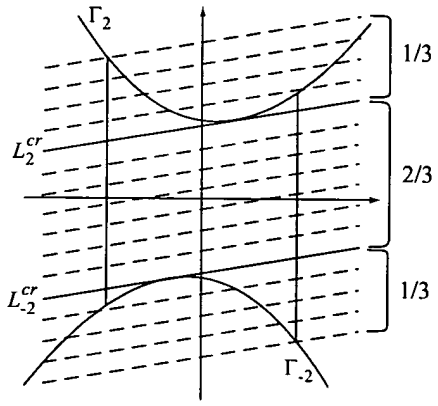


FIGURE 11

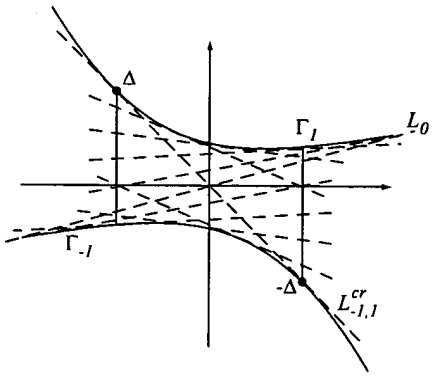


FIGURE 12

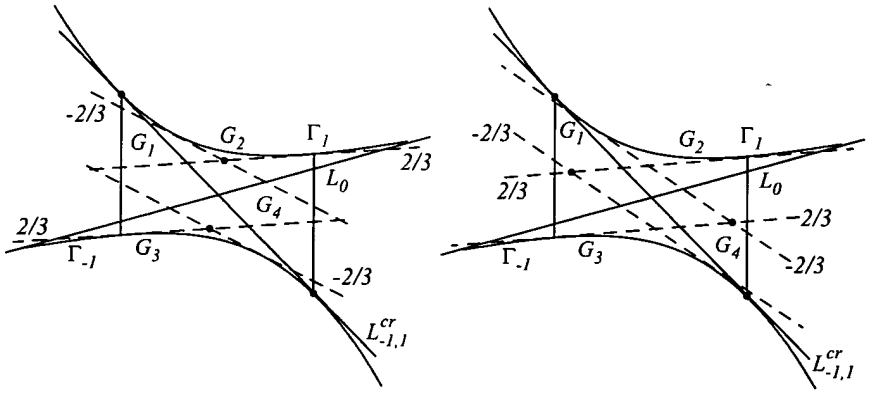


FIGURE 13

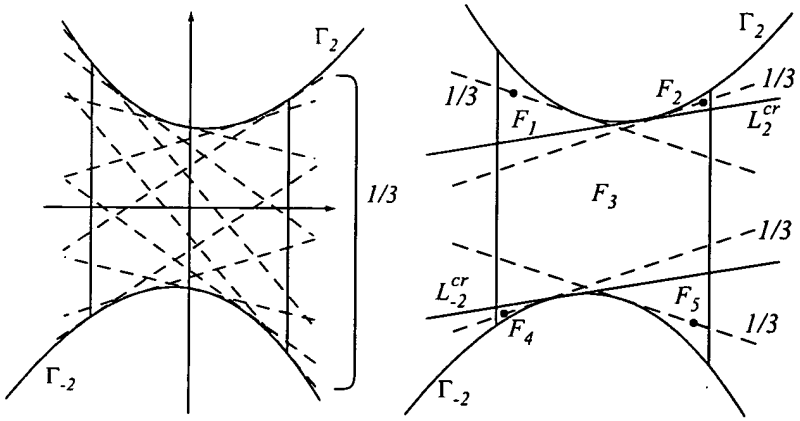


FIGURE 14

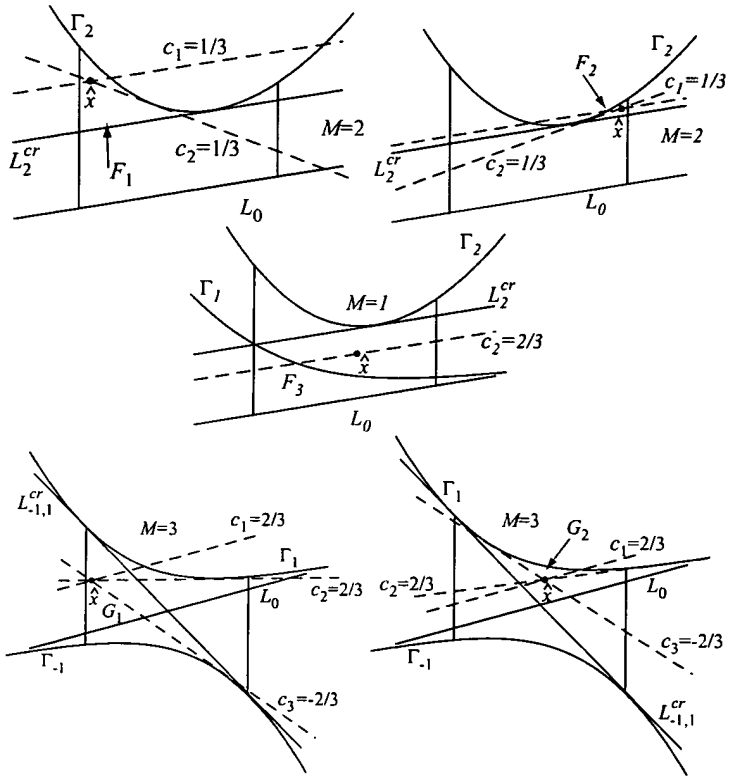


FIGURE 15

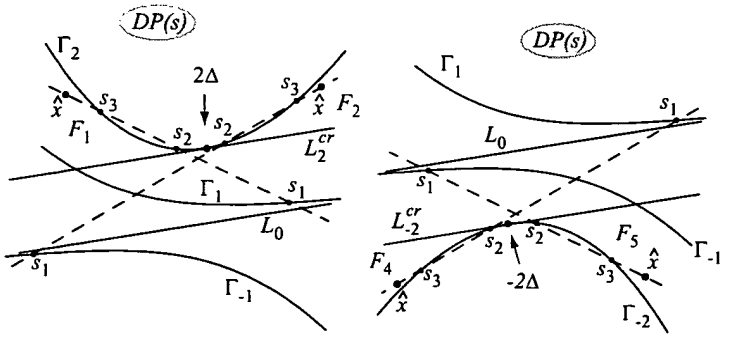


FIGURE 16

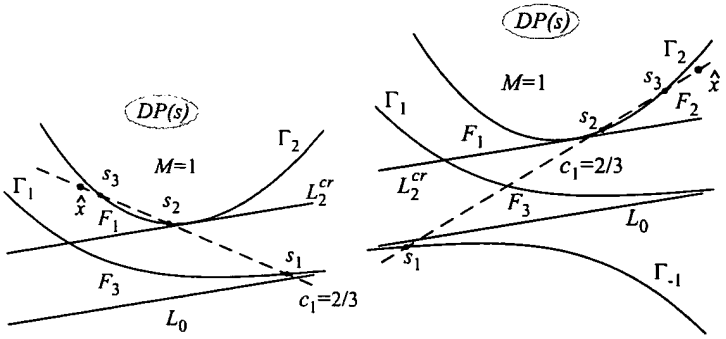

DP(s)
M=1
Γ2
Γ1
s3
x̂
s2
L2cr
F1
s1
F3
c1=2/3
L0
DP(s)
M=1
Γ2
s3
x̂
Γ1
F2
F1
s2
c1=2/3
L2cr
F3
L0
s1
Γ-1

FIGURE 17

Fig. 18

Step 20. Finding families of lines for filtering

Step 21. From the family of lines $\mathcal{L}_0$ choose an equidistant set of lines that are parallel to the spiral tangent and that cover the projection of the region of interest onto the detector plane located between Γ_2 and Γ_{-2} (see Fig. 11).

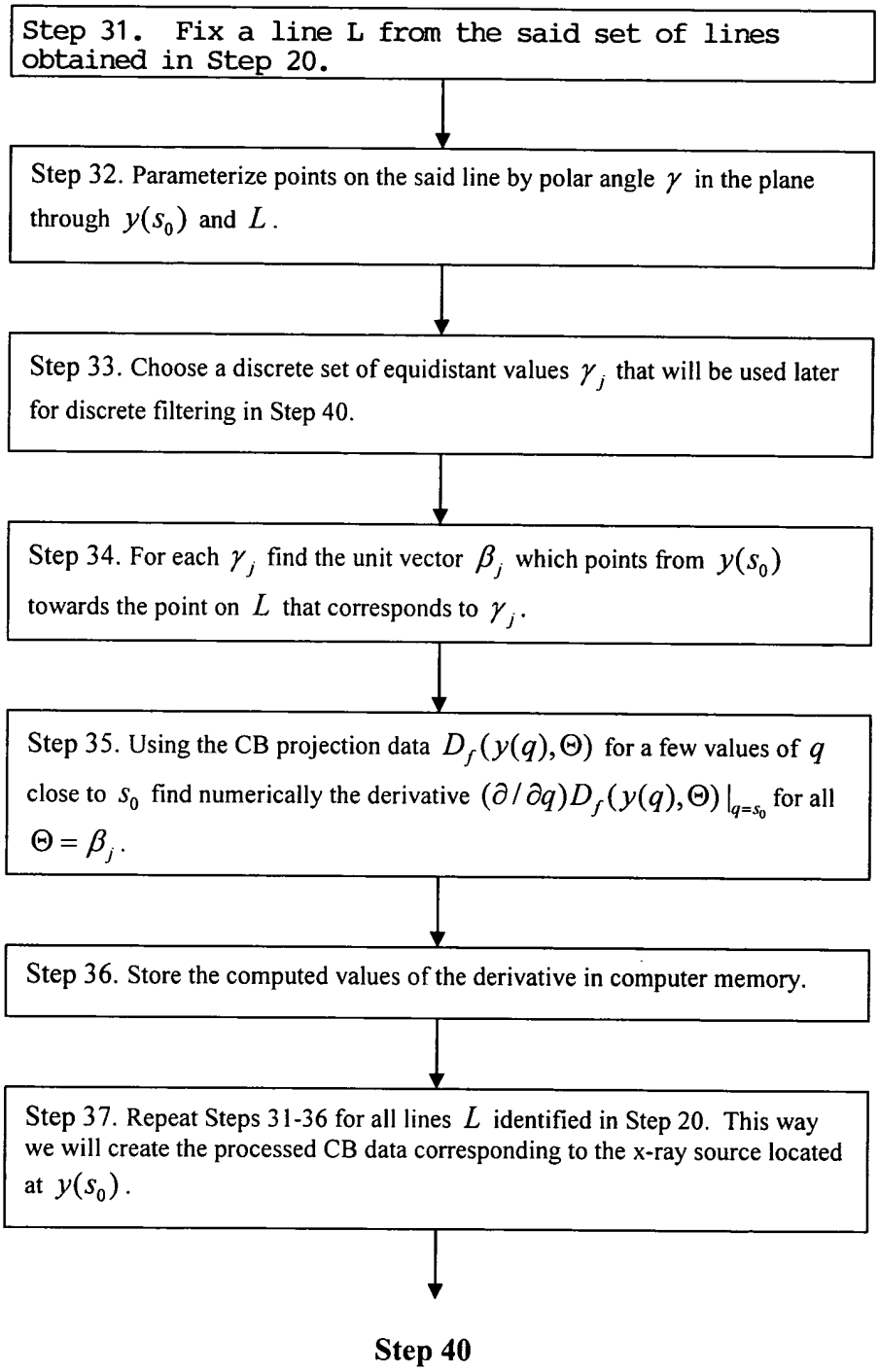
Step 22. From the family of lines $\mathcal{L}_1$ choose a discrete set of lines that are tangent to Γ_1 and Γ_{-1} (see Fig. 12). The extreme left point of tangency on Γ_1 should coincide with the point where the double tangent line $\mathcal{L}_{-1,1}^{cr}$ is tangent to Γ_1. Similarly, the extreme right point of tangency on Γ_{-1} should coincide with the point where the double tangent line $\mathcal{L}_{-1,1}^{cr}$ is tangent to Γ_{-1}.

Step 23. From the family of lines $\mathcal{L}_2$ choose a discrete set of lines that are tangent to Γ_2 and Γ_{-2} (see Fig. 14, left panel). In both cases the points of tangency do not have to extend beyond the projection of the region of interest onto the detector plane. In case of the improved algorithm, instead of the lines tangent to Γ_2 and Γ_{-2}, we choose a discrete (say, equidistant) set of values for s_3 on the curves Γ_2 and Γ_{-2} and then determine the lines $L \in \mathcal{L}_2'$ by solving equations (21), (22). On both curves the points s_3 do not have to extend beyond the projection of the region of interest onto the detector plane.

Step 30

Fig. 19

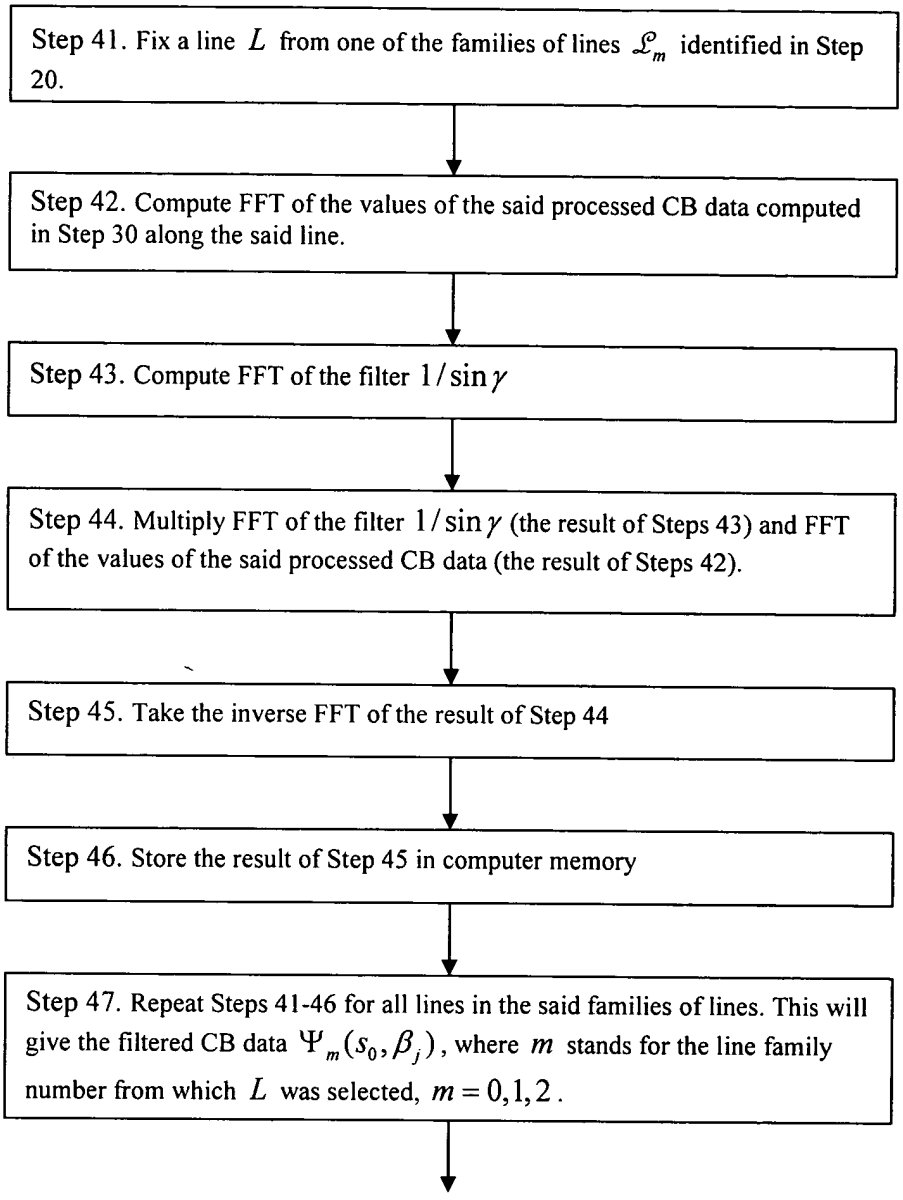
Step 30. Preparing for filtering



Step 40

Fig. 20

Step 40. Filtering



Step 50

Fig. 21

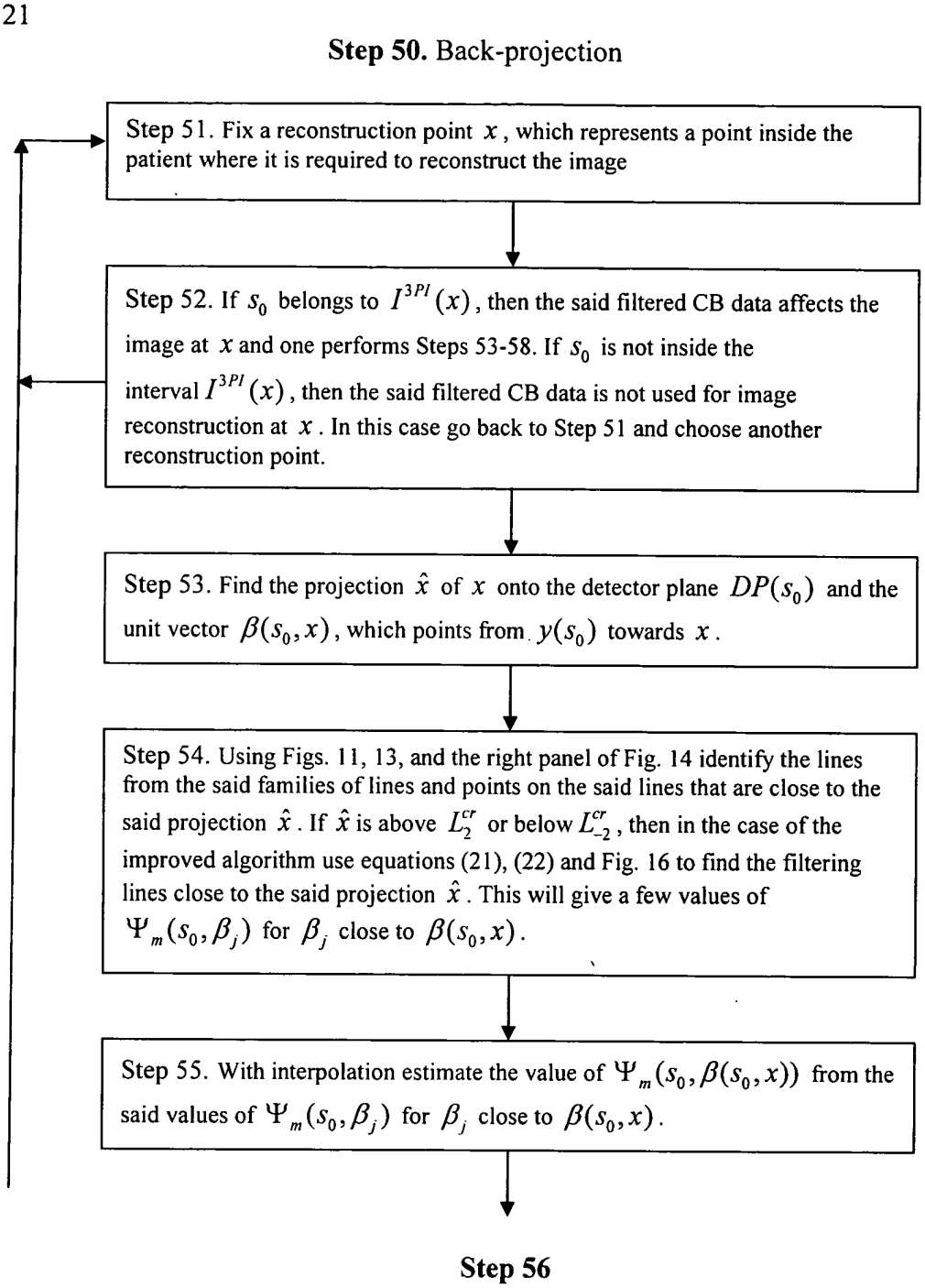

Step 50. Back-projection
Step 51. Fix a reconstruction point x, which represents a point inside the patient where it is required to reconstruct the image
Step 52. If s_0 belongs to $I^{3PI}(x)$, then the said filtered CB data affects the image at x and one performs Steps 53-58. If s_0 is not inside the interval $I^{3PI}(x)$, then the said filtered CB data is not used for image reconstruction at x. In this case go back to Step 51 and choose another reconstruction point.
Step 53. Find the projection $\hat{x}$ of x onto the detector plane $DP(s_0)$ and the unit vector $\beta(s_0, x)$, which points from $y(s_0)$ towards x.
Step 54. Using Figs. 11, 13, and the right panel of Fig. 14 identify the lines from the said families of lines and points on the said lines that are close to the said projection $\hat{x}$. If $\hat{x}$ is above L_2^{cr} or below L_{-2}^{cr}, then in the case of the improved algorithm use equations (21), (22) and Fig. 16 to find the filtering lines close to the said projection $\hat{x}$. This will give a few values of $\Psi_m(s_0, \beta_j)$ for β_j close to $\beta(s_0, x)$.
Step 55. With interpolation estimate the value of $\Psi_m(s_0, \beta(s_0, x))$ from the said values of $\Psi_m(s_0, \beta_j)$ for β_j close to $\beta(s_0, x)$.
Step 56

Fig. 22

Step 50. Back-projection (continuation)